

Simple oxygen treatment could help patients 'dramatically improve' following brain injury

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Motor learning skills let us move through the world: we use them to teach ourselves how to walk, how to pick up a drink, how to run. But age or sickness can weaken our ability to learn motor tasks. Scientists studying the impact of oxygen supplementation on motor learning have found a promising treatment that could help patients who have experienced neurological trauma recover old skills.

"A simple and easy to administer treatment with 100% [oxygen](#) can drastically improve human motor learning processes," said Dr. Marc Dalecki, now at the German University of Health and Sports in Berlin, senior author of the study in *Frontiers in Neuroscience*.

Repurposing a frontline treatment

Our brains need a lot of oxygen. In low-oxygen contexts cognitive function decreases, while in high-oxygen contexts it recovers, and the delivery of 100% oxygen is already used to help preserve as much of the brain as possible in patients with neurological injuries.

Motor learning is particularly dependent on oxygen-reliant information processing and memory functions: humans learn by trial and error, so the ability to remember and integrate information from previous trials is critical to efficient and effective motor learning. So could supplementing oxygen while learning a motor task help people learn faster and more effectively, offering hope for neurorehabilitation patients?

"I had this idea in my mind for almost a decade and promised myself to investigate it once I got my own research lab," said Dalecki, who led the [experimental research](#) at the School of Kinesiology at Louisiana State University. "And with Zheng Wang, now Dr. Zheng Wang, I had the perfect doctoral student to run it—a keen physiotherapist with a clinical background and stroke patient experience."

Hand-eye coordination

Dalecki and Wang recruited 40 participants, 20 of whom received 100% oxygen at normobaric pressure and 20 of whom received medical air (21% oxygen) through a [nasal cannula](#) during the "adaptation" or learning phase of a task.

Dalecki and Wang selected a simple visuomotor task which involved drawing lines between different targets on a digital tablet with a stylus. The task was designed to test how quickly the participants were able to integrate information from the eye and hand, a crucial part of motor learning. After the task had been learned, the alignment of the cursor and the stylus was altered to see how effectively the participants adapted to the inconsistency, and then realigned for a final session to see how they adapted to the realignment.

"The oxygen treatment led to substantially faster and about 30% better learning in a typical visuomotor adaptation task," said Wang, first author of the study and now at the Mayo Clinic in Rochester. "We also demonstrate that the participants were able to consolidate these improvements after the termination of the oxygen treatment."

Oxygen improved learning by 30%

The scientists found that the participants who had received oxygen learned faster and performed better, improvements which extended into later sessions of the task when oxygen was not administered.

The oxygen group moved the pen more smoothly and more accurately, and when the cursor was adjusted in a deliberate attempt to throw them off, they adapted more quickly. They also made bigger mistakes when the alignment of the stylus was corrected, suggesting they had integrated the previous alignment more thoroughly than the other group.

Dalecki and Wang plan to investigate the long-term effects of this supplementation on learning and test the intervention with other [motor learning](#) tasks: it is possible that the relevant brain functions for this task in particular benefit from high ambient oxygen levels, leading to the observed advantages in performance. They also hope to bring the oxygen treatment to elderly and injured people, in the hope that it will help them

re-learn motor skills.

"Our future plan is to investigate whether this treatment can also improve motor recovery processes following brain trauma," said Dalecki. "Since it worked in the young healthy brain, we expect that the effects may even be larger in the neurologically impaired, more vulnerable brain."

More information: Boost your brain: A simple 100% normobaric oxygen treatment improves human motor learning processes, *Frontiers in Neuroscience* (2023). DOI: [10.3389/fnins.2023.1175649](https://doi.org/10.3389/fnins.2023.1175649).
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